

(19)



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11)

**EP 0 668 751 B2**

(12)

**NEW EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the opposition decision:

09.07.2003 Bulletin 2003/28

(45) Mention of the grant of the patent:  
12.08.1998 Bulletin 1998/33

(21) Application number: 93924257.4

(22) Date of filing: 25.10.1993

(51) Int Cl.7: **A61C 8/00**

(86) International application number:  
PCT/SE93/00871

(87) International publication number:  
WO 94/009717 (11.05.1994 Gazette 1994/11)

(54) **FIXTURE IN A DENTAL IMPLANT SYSTEM**

**BEFESTIGUNGSVORRICHTUNG FÜR EIN DENTALES IMPLANTATSYSTEM**

**APPAREIL DE FIXATION POUR SYSTEME D'IMPLANT DENTAIRE**

(84) Designated Contracting States:  
**AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL  
PT SE**

(30) Priority: 28.10.1992 SE 9203184

(43) Date of publication of application:  
30.08.1995 Bulletin 1995/35

(73) Proprietor: **AstraZeneca AB**  
151 85 Södertälje (SE)

(72) Inventors:  
• **HANSSON, Stig, Gustav, Vilhelm**  
S-436 00 Askim (SE)  
• **HOLMEN, Anders**  
S-427 38 Billdal (SE)

(74) Representative: **Giver, Sören Bo et al**  
**Awapatent AB,**  
**P.O. Box 113 94**  
**404 28 Göteborg (SE)**

(56) References cited:  
**EP-A- 0 388 576** WO-A-92/05745  
**DE-A- 4 130 891** US-A- 4 723 913  
**US-A- 4 826 434**

Remarks:

The file contains technical information submitted  
after the application was filed and not included in this  
specification

**EP 0 668 751 B2**

## Description

[0001] The present invention relates to a fixture of a dental implant system as defined in the preamble of claim 1.

## Background to the invention

[0002] Fixtures having a cylindrical main body and a conically flaring upper portion or neck have been known and used in the art of dental implants for a long period of time. These fixtures are to be inserted into bore-holes in the jaw-bone in order to become osseointegrated to the bone tissue. The cylindrical parts generally osseointegrate correctly provided the proper techniques are used.

[0003] There are however some difficulties regarding the osseointegration around the conical neck portion of the implants which portion normally is smooth or polished. For some reason the bone tissue may degenerate around a smooth or polished conical part (bone resorption), leaving a pocket in the bone tissue around the conical part. The mechanism behind this is not quite clear. These pockets normally are accepted as inevitable although it is not entirely satisfactory that not the entire implant is osseointegrated, particularly since this pocket is formed in the strongest part of the bone tissue, the cortical bone.

## Short description of the inventive concept

[0004] It surprisingly has been found that the provision of a circumferentially or tangentially oriented, defined micro-roughness on the outer side of the conically flaring portion of the fixture having a height which varies between 0.05 and 0.15 mm alleviates this problem, the risk for pockets in the bone tissue around the conically flaring portion being minimized.

[0005] In preferred embodiments the micro-roughness, as set forth in the appended dependent claims, may be in the form of circumferential beads or microthreads.

## Short description of the appended drawings

### [0006]

Fig 1 shows the exterior of a fixture according to the invention.

Fig 2 shows the fixture in fig 1, partly sectioned.

## Detailed description of a preferred embodiment of the invention

[0007] In the description below, the invention is illustrated by means of micro-threads. It should be noted that the description in the relevant parts (i. e. the parts not

relating directly to the helical nature of the threads) also is applicable to the embodiment featuring the circumferential beads and that this choice does not reflect any preference regarding the two embodiments.

[0008] Thus, in a preferred embodiment, the invention comprises an implant or fixture having a generally cylindrical body 1 for insertion into a bore-hole into bone tissue. The envelope surface of the body 1 is provided with conventional threads 2. These threads will allow the implant to function as a screw. The forward end or the tip of the screw is provided with three cutting edges 4 together with chip-collecting cavities 3.

[0009] The cutting edges 4 and the chip-collecting cavities 3 will allow the screw, if necessary, to function as a self-tapping screw for cutting new threads or adjusting already cut threads in the tissue.

[0010] The other end of the screw is, as is quite conventional in the art, provided with a longitudinal bore for the attachment of an abutment for bridging the soft tissue covering the bone tissue and for the attachment of a prosthesis. The inner part 7 of the bore is cylindrical and provided with interior threads 6 and the outer part 5 of the bore, which is located in a conically flaring portion 10) is conically flaring in order to accommodate a conically tapering attachment part of an abutment. The transitional portion between the conical part and the cylindrical bore comprises a hexagonal socket 8 which is intended to cooperate with a corresponding, hexagonal part of the abutment in order to allow the abutment to be oriented and locked in specific rotational positions relative to the fixture.

[0011] As can be seen in Figs 1 and 2, the outer side of the conically flaring portion 10 is provided with threads serving as oriented micro-roughness. The threads may be 0.1 mm high and the distance to the adjacent thread (crest to crest) may be 0.2 mm. The threads are here called microthreads (and the beads microbeads) since their height and distance from each other are in the micrometer range. The microthreads may be multiple-threaded, for instance triple-threaded which means that the pitch of the thread would be 0.6 mm. The angle between the flanks of a microthread may for instance be 45° or 60°. The microthreads have a rounded design in order to avoid, or at least minimize, stress-concentrations in the bone tissue around the microthreads.

[0012] The height of the microthreads is between 0.05 and 0.15 mm and in a preferred embodiment, described above, the height is 0.1 mm. The number of threads is optional but may for instance vary between 1 and 5.

[0013] The microthreads can be regarded as a defined, oriented roughness being in the same size range as the kind of prior art non-oriented surface roughness, which for instance may be obtained by plasma-spraying (a conventional technique for obtaining a surface roughness on implants). A non-oriented roughness having smaller dimensions, for instance obtained by blasting, may be superimposed on the microthreads.

[0014] New bone tissue will rapidly grow into the mi-

cro-threads due to the low height of the threads and a retention which is considerably better in the axial direction than in the rotational (tangential) direction will be obtained relatively fast. This of course is a result of the threads being oriented circumferentially.

[0015] It would seem that the positive results obtained by this design may be explained as follows:

[0016] When the bone tissue has grown into the spaces between individual projections of the micro-roughness, the axial loads on the implant may be transmitted in an axial direction (related to the axial direction of the fixture) to the bone tissue around the conical portion in a biomechanically correct way, i. e. in such a way that the bone tissue is stressed correctly around the conical part and that bone resorption consequently does not occur.

[0017] Above, the fixture has been described as having normal threads on the cylindrical main body. It may however be particularly advantageous if both the main body and the conically flaring part is provided with micro-threads, since this will allow the fixture to be used both as a fixture which gently can be tapped or pushed into the bore-hole and as a fixture which easily can be screwed into, or unscrewed from, the bore-hole.

[0018] It should be emphasized that the invention is not limited to the embodiments described above and can be varied in many ways within the scope of the appended claims.

#### Claims

1. Fixture (1,10) of a dental implant system for implantation in bone tissue having a generally cylindrical main body provided with threads allowing the fixture to function as a screw, and an outer end provided with a conically flaring portion (10) which is intended to at least partly abut the bone tissue when the fixture is implanted,  
*characterised in*  
that the outer side of the conically flaring portion is provided with a circumferentially oriented, defined micro-roughness (9) having a height in the range of 0.05-0.15 mm.
2. Fixture according to claim 1, *characterised in* that said micro-roughness has a height of 0.1 mm.
3. Fixture according to claim 1 or 2, *characterised in* that the defined micro-roughness is in the form of circumferential beads.
4. Fixture according to claim 1 or 2, *characterised in* that the defined micro-roughness is in the form of a microthread (9).
5. Fixture according to claim 3 or 4, *characterised in* that the distance between adjacent threads or

beads, crest to crest, is twice the height of the threads or beads.

#### Patentansprüche

1. Fixierteil (1, 10) eines Dentalimplantatsystems zur Implantation in Knochengewebe, wobei ein im allgemeinen zylindrischer Hauptkörper mit Gewindengängen versehen ist, die dem Fixierteil gestatten, wie eine Schraube zu funktionieren, und ein äußeres Ende mit einem sich konisch aufweitenden Teil (10) versehen ist, der zumindest teilweise an das Knochengewebe anstoßen soll, wenn das Fixierteil implantiert ist, *dadurch gekennzeichnet, daß* die Außenseite des sich konisch aufweitenden Teils mit einer um den Umfang ausgerichteten, definierten Mikrorauheit (9) mit einer Höhe in einem Bereich von 0,05 bis 0,15 mm versehen ist.
2. Fixierteil nach Anspruch 1, *dadurch gekennzeichnet, daß* die Mikrorauheit eine Höhe von 0,1 mm aufweist.
3. Fixierteil nach Anspruch 1 oder 2, *dadurch gekennzeichnet, daß* die Mikrorauheit in Form von Umfangswülsten vorliegt.
4. Fixierteil nach Anspruch 1 oder 2, *dadurch gekennzeichnet, daß* die definierte Mikrorauheit in Form eines Mikrogewindes (9) vorliegt.
5. Fixierteil nach Anspruch 3 oder 4, *dadurch gekennzeichnet, daß* der Abstand zwischen benachbarten Gewindengängen oder Wülsten von Scheitel zu Scheitel zweimal die Höhe der Gewindengänge oder Wülste beträgt.

#### Revendications

1. Appareil de fixation (1, 10) pour système d'implant dentaire destiné à être implanté dans le tissu osseux, ayant un corps principal essentiellement cylindrique muni de filets permettant à l'appareil de fixation de fonctionner à la manière d'une vis, et une extrémité extérieure munie d'une section évasée de forme conique (10) qui a pour fonction d'abouter, au moins partiellement, le tissu osseux lorsque l'appareil de fixation est implanté, *caractérisé en ce que* la partie extérieure de la section évasée conique est munie de micro-anfractuosités (9) définies orientées le long de sa circonférence, d'une hauteur comprise entre 0,05 et 0,15 mm.
2. Appareil de fixation suivant la revendication 1, *caractérisé en ce que* lesdites micro-anfractuosités présentent une hauteur de 0,1 mm.

50 mm

50 mm

105

3. Appareil de fixation suivant la revendication 1 ou 2, caractérisé en ce que les micro-anfractuosités définies se présentent sous la forme de cordons circonférentiels.

5

4. Appareil de fixation suivant la revendication 1 ou 2, caractérisé en ce que les micro-anfractuosités définies se présentent sous la forme d'un micro-filetage (9).

10

5. Appareil de fixation suivant la revendication 3 ou 4, caractérisé en ce que la distance entre deux filets ou cordons adjacents, de crête à crête, s'élève au double de la hauteur des filets ou cordons.

15

20

25

30

35

40

45

50

55

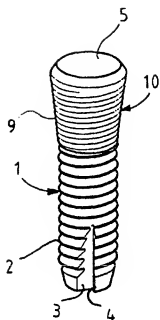


FIG 1

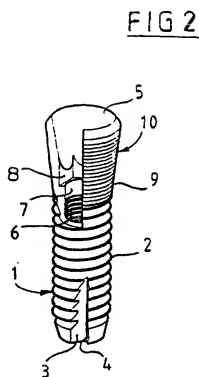


FIG 2